

**DISCUSSION OF MR. WILLIAM CHARLTON'S PAPER
ON THE "USE OF RATCHET AND OTHER HAND-
MACHINE DRILLS IN THE CLEVELAND MINES."***

Mr. W. CHARLTON said that the use of ratchet and other hand-machine drills in the Cleveland mines commenced in 1886, and from 0·50 per cent. of the ironstone won by this class of machine in that year, it had increased in 1901 to 39·55 per cent.; in 1902 to 46·92 per cent., and in 1903 to 64 per cent.† It would thus be recognized that in the Cleveland mines, the use of the old jumper-drill had been discarded in favour of power or ratchet-drills. There was a misprint in the last line of a paragraph which should read "power-machines, but by the use of hand-machines."‡

Prof. HENRY LOUIS asked for information as to the date of the introduction of the rotary or ratchet-drill into the North of England generally, as Mr. Charlton gave 1880 as the date of its introduction into the Cleveland district. The earliest dates that he had been able to obtain, so far, were 1869 at Usworth colliery, and about 1872 at Hedley Hill colliery; but he would be glad of more definite information. So far as he could learn, such drills were first devised for use in the Scotch oilshale-fields about 1865; the use seemed to have extended southward about 4 or 5 years later, and they were used for boring in stone before they were tried in coal. It was very curious that in this comparatively brief period they should have so completely supplanted jumper-drills, that it was scarcely possible to find a coal-miner able to use the latter. He had seen a crude rotary drilling-machine, known locally as a "garibaldi," used in the soft-coal region of Pennsylvania, while the stone in the same mine was drilled with a hammer and drill; he thought that this crude machine must have been of independent local invention, and had not been imported.

Mr. T. E. FORSTER said that hand-machine drills, for boring in coal, were introduced into Northumberland about 1879. They were in use considerably before that date for driving stone-drifts.

* *Trans. Inst. M.E.*, 1902, vol. xxiv., page 526.

† *Ibid.*, page 534.

‡ *Ibid.*, page 537, line 14.

Mr. J. H. MERIVALE said that at Broomhill collieries, so far as he could remember, hand-drills were used for boring in coal about 1884 and for boring in stone, about three years later.

Mr. T. E. FORSTER asked whether the rotary drill had ever been used in Cleveland for boring in any stone harder than ironstone.

Mr. W. CHARLTON stated that Cleveland ironstone was much harder than coal, and a ratchet-machine could drill through the "dogger-band" in the ironstone, although it was much harder.

Mr. C. H. STEAVENSON said that he had had experience with ratchet drilling-machines in Cleveland mines; so when he came to Tyneside he brought a ratchet-drill with him, and had it tried in both stone and coal, but he was sorry to say that it was not successful. The fixing of the machine was difficult where the post-stone was too hard to drive in a wedge for the purpose of attaching the machine. In the case of ironstone, the wedge was driven into the rock at the side, and the end of the machine was fixed against this wedge. A hole was made for the entrance of the drill, and when the man started to work the ratchet the pressure kept the drill in position. In the post-stone of North of England collieries he found that the wedge could not be driven in far enough to make a sufficiently strong support for the machine, and in the case of blue metal or shale, the stone was too soft. Altogether he found that the ratchet drilling-machine was not so successful as the ordinary stone-man's or hewer's hand drilling-machine.

Mr. W. CHARLTON said that his paper showed the great advantage of the Cleveland method of fixing hand drilling-machines, and how that advantage had promoted their use in the ironstone-mines. Where that method could not be adopted, they could adopt the old-fashioned method of making a prop serve as a support for the machine.

Mr. WILLIAM SEVERS said that, at one of his collieries, a drift, 12 feet wide by 6 feet high, was being driven with ratchet-machines, and a prop was used as a support for the machine. Hand-drilling cost £10 per yard, but with ratchet-machines the cost was reduced to £7 per yard.

Mr. C. H. STEAVENSON said that his remarks referred to the type of drilling-machine used in Cleveland. Ratchet-machines were in use on Tyneside, but they were of a different type from the drills used in Cleveland.

The PRESIDENT (Mr. W. O. Wood) said that drilling-machines were introduced into the collieries of the North of England about 1872, and they were now universally used. It was rare to see a man using a hammer and drill, or even a jumper. At his own collieries, no difficulty was found in fixing the machine as Mr. Steavenson seemed to indicate: sometime props were used, and at other times, a proper stand.

Mr. WILLIAM SEVERS remarked that the men used the machine with a stand at first; but now it was discarded altogether, and a prop was used.

Mr. F. I. LESLIE DITMAS wrote that the displacement of the old method of jumping in the holes, naturally showed the advance that the Cleveland district had made in the reduction of the working costs of the mines, and the gradual evolution of man-power to that of man-and-machine-power, which was in its turn giving place to that of power-machines, driven by compressed air or electricity.

At one of the Rosedale mines, practically all the drilling was done by an electric drill, which differed in many respects from the other electric drills in use in Cleveland. It was found, when using electrically-driven drills, that a certain percentage of holes must of necessity be bored which were quite useless (this was a matter of slight moment, as the holes were drilled so rapidly) and which hand-machines would avoid, as, in this latter case, firing took place immediately after each hole was put in, and the next hole could be placed in the most advantageous position.

With hand-drills, the ratchet and Elliott machine-stand were used, but there were still a number of the older miners, who liked to be supplied with jumper-drills in addition. They argued and in most cases rightly, that for certain positions (especially in removing the pillars), it was an easier and a faster method to jump the holes, than to fix the Elliott telescopic machine-frame in a place 9 or 10 feet high, if the timbering were not quite

suitable, and only a "pop-hole" was required. The physical labour involved in jumping a hole was greater, and more time was required than when it was drilled by a machine; and it was simply a matter of time when jumpers would cease to exist, except for occasional and exceptional conditions. The younger miners, now, hardly knew how to obtain the best results from using the jumper-drill, nor did they care to learn how to use it. Of course, the power-drill (electric-driven for preference) would in time displace the best hand-machine drills used in most iron-stone-mines.

DISCUSSION OF MR. C. C. LEACH'S PAPER ON "SUPER-HEATED STEAM AT SEGHILL COLLIERY."*

Mr. C. C. LEACH said that he had carried out some further experiments to ascertain the loss of steam in steam-pipes. The experiments were made on a Sunday, when all the engines were stopped, except the donkey-pump, which fed the boilers. The test was continued from 7 a.m. to 5 p.m., the boiler-pressure was maintained to 80 pounds per square inch, and no steam was blown off. The temperature of the air was 57·8° Fahr. He found that 2,450 pounds of water per hour went into the boilers. Of this weight, the donkey-pump used for pumping the water into the boilers consumed 49 pounds, and 608 pounds were caught at leaks and steam-traps, leaving 1,793 pounds per hour to be accounted for. The coal burned per hour was 240 pounds, and this showed a loss of 9·6 per cent. on the ordinary day's coal-work. The area of the surface of the pipes, beneath the covering, was 3,036 square feet.

Mr. W. C. BLACKETT asked whether much water was found standing in the cylinders.

Mr. C. C. LEACH said that he had no idea, but steam was passing through the cylinder of the big winding-engine, as it felt warm to the touch of the hand.

Mr. J. H. MERIVALE said that these experiments were exceedingly interesting, but before the members could form a definite idea they would require considerably more information. The loss of water seemed enormous, if all the engines were

* *Trans. Inst. M.E.*, 1902, vol. xxiv., page 538.